On page 11, in the paragraph beginning at line 5, the spelling of the word "palladium" is corrected and a comma "," is added to appropriately distinguish between terms in the list. Further, the repetitive reference to "intermetallics" is deleted. Finally, the repetitive reference to "garnet or diamond" is deleted.

On page 27, in the paragraph beginning at line 7, the first sentence is deleted as it was inadvertently left in the specification from the draft and the referenced standard is set forth in the second sentence. The substance of the first sentence is combined with the second sentence by the amendments to the second.

On page 28, in the paragraph beginning at line 14 and continuing over to page 29, a comma "," is inserted before "which" for proper grammatical construction.

On page 29, in the paragraph beginning at line 9, the word "pending" is replaced by the word "bending" to correct a typographical error.

Finally, claim 23 is amended to correct a typographical error by replacing the article "an" with "a."

Rejections Under 35 U.S.C. § 102:

Claims 21-25, 28, and 48-50 are rejected in the Office action under 35 U.S.C. § 102(b) as anticipated by Zimmer, U.S. Patent No. 5,921,856. Applicants disagree and contend that none of the claims pending in the present application are anticipated by Zimmer.

Claim 21 is an independent claim to an electrical component assembly comprising a substrate with a plurality of electrical contact sites with a plurality of hard particles affixed to the contact sites. Claims 22-25 and 28 are dependent upon claim 21.

Zimmer discloses a polishing pad conditioning head covered with a diamond grit for removing the top layer of polishing pads used to polish semiconductor wafers. (See col. 1 ll. 20-45 and col. 3, ll. 23-53.) The Office action states that Figures 1A-9B, and specifically Figure 4, of Zimmer disclose a substrate with a plurality of electric contact sites, which are described as inherent on the surface of the substrate. Neither the substrate of Figure 4, nor any of the other figures in Zimmer, have a plurality of electrical contact sites, or even a single electrical contact site. The substrate of Zimmer is a polishing pad conditioning head (see col. 2, ll. 65-67); there are no associated electrical contacts, inherent or otherwise.

The polishing pad conditioning head of Zimmer is made of a material "able to grow chemical vapor deposit diamond," e.g., silicon carbide, sintered carbide, tungsten carbide, silicon, and sapphire. (See col. 4, l. 66 – col. 5, l. 2.) Zimmer teaches growing a covering of CVD diamond on top of diamond grit placed on the substrate to create an improved polishing

surface over the prior art. (See col. 3, ll. 40-53.) Nowhere in Zimmer is it suggested that the polishing pad conditioning head includes electrical contact sites, nor is there any logical basis for a polishing pad conditioning head to have electrical contacts. The purpose of a polishing pad conditioning head is to grind a thin layer off the surface of a polishing pad.

Claim 22 of the present application includes the further element of a nickel coating over the hard particles on the electrical contact sites. In the background section of Zimmer, prior art polishing pads are discussed that are made of steel plate covered by diamond grit, which is then overcoated with nickel. (See col. 1, l. 66 –col.2 l. 2.) There is then discussion of how such polishing pads used for polishing wafers silicon wafers. However, Zimmer does not teach or suggest that the diamond grit and nickel overcoat cover a substrate with electrical contact sites, or more directly the electrical contact sites themselves.

The Office action fails to state a basis for rejection of claims 23-25 as the additional elements of these claims are not shown to be taught in any reference cited. Claims 23-25 of the present application include the further element of a non-conductive adhesive applied to the substrate and the hard particles thereon. There is no teaching or suggestion in Zimmer of any use of an adhesive for any purpose at all.

Claim 28 of the present application provides that the hard particles of the instant invention may be diamond, nickel-plated diamond, garnet, and silicon carbide. Zimmer does not teach or suggest the use of garnet or silicon carbide as particles for use with the polishing pad conditioning head it discloses, or for any other purpose. Zimmer's use of diamond, and the discussion of the use of nickel-plated diamond in the background, is wholly different from the substrate claimed in the present application as previously explained.

Claim 48 of the present application a printed circuit interconnection assembly composed of a printed circuit board with a plurality of electric contact sites thereon with a plurality of hard particles affixed to the contact sites. Claims 49 and 50 depend from claim 48. With respect to the rejection of claim 48, there is no teaching or discussion in Zimmer of the substrate of the polishing pad conditioning head being a printed circuit board as suggested in the Office action. Further, as previously noted, neither the substrate of Figure 4, nor any of the other figures in Zimmer, have a plurality of electrical contact sites, or even a single electrical contact site. Figure 4 does not show a printed circuit board substrate. The description of Figure 4 in Zimmer clearly states that Figure 4 is "a polishing pad conditioning head . . . ." (See col. 2, l. 66.)

The Office action fails to state a basis for rejection of claims 49-50 as the additional elements of these claims are not shown to be taught in any reference cited. Claims 49 and 50

of the present application include the further element of a non-conductive adhesive applied to the substrate and the hard particles thereon. There is no teaching or suggestion in Zimmer of any use of an adhesive for any purpose at all.

Rejections Under 35 U.S.C. § 103:

The Office action rejects claims 21-28 and 48-54 as obvious in consideration of Yamagata et al., U.S. Patent No. 6,183,874. Although the rejections are premised on 35 U.S.C. § 103, no further references are cited in combination with Yamagata et al. as suggesting or teaching the elements of the claims pending in the present application. Further, other than the discussion of the applicability of Yamagata to claims 21 and 48, only claims 52-54 are addressed pursuant to the 35 U.S.C. §103 rejection in the Office action. It is axiomatic that all claim limitations must be taught or suggested in the prior art in order to establish a rejection for obviousness under 35 U.S.C. § 103. See MPEP §2143.03. "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F. 2d 1382 at 1385 (C.C.P.A. 1970). Recognizing such, the Office action has not provided a basis for rejection of claims 22-28 and 49-51, and as such Applicants request these rejections be withdrawn.

If any of the claim rejections pursuant to 35 U.S.C. §103 is based upon the Yamagata reference in combination with reliance on common knowledge, Applicants traverse such rejection and request the presentation of appropriate references teaching each of the elements of the claims presented in this application. See MPEP § 2144.03. "The patent examiner . . . [is] deemed to have experience in the field of the invention; however, this experience, insofar as applied to the determination of patentability must be applied from the viewpoint of 'the person having ordinary skill in the art to which the subject matter pertains,' the words of section 103. In finding the relevant facts, in assessing the significance of the prior art, and in making the ultimate determination of the issue of obviousness, the examiner . . . [is] presumed to act from this viewpoint. Thus when . . . [the examiner] rel[ies] on what . . . [the examiner] assert[s] to be general knowledge to negate patentability, that knowledge must be articulated and placed on the record. . . . The . . . [examiner] cannot rely on conclusory statements when dealing with particular combinations of prior art and specific claims, but must set forth the rationale on which . . . [he] relies." *In re Lee*, 00-1158 (Fed. Cir. January 18, 2002).

Yamagata et al. is directed to the composition of a substrate for supporting or mounting a semiconductor device. The substrate is an alloy of aluminum and silicon-carbide

that form a homogenous composite through a sintering process at high temperatures. (See, e.g., col. 5, ll. 6-31.) The section of Yamagata et al. referenced in the Office action (col. 10, l. 57 – col. 11, l. 35) describes the substrate thus formed as a matrix of aluminum within which the silicon carbide particles are dispersed and it further acts as a semiconductor. Yamagata et al. further notes the semiconductor alloy substrate may be plated with nickel or gold to protect the aluminum in the alloy from oxidation.

The invention of claim 21 of the present application comprises a substrate with electrical contact sites upon which hard particles are placed and affixed. In contrast, the substrate of Yamagata et al. is itself comprised of hard particles held in an aluminum matrix. These hard particles are not placed upon the surface of the substrate; the hard particles are dispersed within and are a part of the substrate itself. Further, no discrete electrical contact sites are shown or described on the substrate of Yamagata et al. While Figures 1-11, cited in the Office action, do show various circuit interconnections, they do not depict any circuit components, e.g., substrates (circuit board or other), with hard particles disposed upon and affixed to electrical contact sites.

The invention of claim 48 in the present application comprises a printed circuit board with electrical contact sites upon which hard particles are placed and affixed. The substrate of Yamagata is not a printed circuit board. The entire substrate of Yamagata et al. is a semi-conducting material. Further, the same differences between Yamagata et al. and claim 21 are equally applicable with respect to claim 48.

The Office action fails to state a basis for rejection of claims 23-25 and 49-50 as the additional elements of these claims are not shown to be taught in any reference cited. Claims 23-25 and 49-50 of the present application include the further element of a non-conductive adhesive applied to the substrate and the hard particles thereon. There is no teaching or suggestion in Yamagata et al. of any use of an adhesive in conjunction with the substrate.

Claims 22, 26, and 51 add the additional element of plated a metal over the hard particles to affix them to the electrical contact sites. In the case of claim 22, this metal is specifically nickel. Yamagata does not teach or suggest over plating of particles for the purpose of affixing particles to electrical contact sites. Yamagata merely suggests that its alloy substrate may be plated with nickel or gold to prevent the aluminum in the alloy from oxidizing. This is a well known problem and solution in the art of using aluminum in electronic components. However, Yamagata et al. does not teach the presently claimed invention, nor is any other reference provided in combination with Yamagata et al. to provide such a teaching.

With respect to claim 27 of the present application, wherein the substrate is further defined as a semiconductor chip, although the substrate of Yamagata et al. is created to be semi-conducting, it is never described as a semiconductor chip.

Claim 28 of the present application provides that the hard particles of the instant invention may be diamond, nickel-plated diamond, garnet, and silicon carbide. Yamagata et al. does not teach or suggest the use of diamond, nickel-plated diamond, or garnet for any use or purpose. The use of silicon carbide particles in Yamagata et al. is in a wholly different manner and for a wholly different purpose as previously indicated in this response.

Claims 52-54 add the additional distinction that the substrate of claim 48 may specifically be a flexible printed circuit board, a smart card chip module, and a smart label, respectively. The Office action states that the selection of a type of circuit board would be merely "a matter of design choice" and therefore obvious to one of ordinary skill in the art to select such substrates based upon the teaching of Yamagata et al. However, as discussed above, the teaching of Yamagata et al. concerns the composition of an aluminum silicon-carbide, semi-conducting substrate, wherein the silicon carbide particles are trapped in an aluminum matrix to form the substrate itself. Yamagata et al. does not teach or suggest the placement of hard particles on the electric contact surfaces of a substrate. No additional teaching has been provided suggesting such a placement of hard particles. Nor has there been any teaching of rationales for selection of particular substrates for particular uses.

Conclusion:

As the references cited by in the Office action do not individually anticipate or in combination render obvious any of the pending claims, Applicants request the withdrawal of the rejections to the claims and swift issuance of a patent. Applicants further request entry of the amendments to the written description and claims as set forth herein.

Respectfully submitted this 25th day of April 2002.

Brad J. Hattenbach, Esq.
Registration No. 42,642
Customer No. 20686

DORSEY & WHITNEY LLP
Republic Plaza Building, Suite 4700
370 Seventeenth Street
Denver, Colorado 80202
303-629-3400 (TEL)
303-629-3450 (FAX)
hattenbach.brad@dorseylaw.com

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Additions are underlined and deletions are shown in ~~strikethrough~~.

- On page 1, changes have been made to the paragraph under the heading "Cross Reference to Related Applications" beginning at line 8 as follows:

This application is a continuation of U.S. application serial number 09/684,238 filed 5 October 2000 entitled "Electrical Component Assembly and Method of Fabrication," now abandoned, which is hereby incorporated herein in its entirety by reference. This application ~~is related to and~~ further claims the benefit of priority of the following applications, which are hereby incorporated herein in their entirety by reference: ~~U.S. application serial number 09/684,238 entitled "Electrical Component Assembly and Method of Fabrication," filed 5 October 2000,~~ U.S. provisional application serial number 60/220,027 filed 21 July 2000 entitled "Advances in Materials for Low Cost Flip-Chip~~," filed 21 July 2000~~;" and U.S. provisional application serial number ~~06/233,561~~ 60/233,561 filed 19 September 2000 entitled "Manufacturing of Low Cost Smart Labels."~~, filed 19 September 2000.~~

- On page 7, changes have been made to the paragraph beginning at line 4 as follows:

The hard particles can be formed from a metal, metal alloy, or an intermetallic. The metals include, for example, copper, aluminum, nickel, tin, bismuth, silver, gold, platinum, ~~paladium~~ palladium, lithium, beryllium, boron, sodium, magnesium, potassium, calcium, gallium, germanium, rubidium, strontium, indium, antimony, cesium, barium, and intermetallics and alloys of these metals. The hard particles can also be formed from a non-metallic material, such as, metal oxides, nitrides, borides, silicon and other carbides, beryllium, boron fibers, carbon fibers, garnet or diamond. Diamond is a preferred non-metallic hard particle. Where non-metallic particles are used, the hard particles are surrounded by a conductive metal. Nickel is a preferred coating for such particles. Where a thermal conductor is desired diamond and ceramics are preferred materials.

- On page 11, changes have been made to the paragraph beginning at line 5 as follows:

A plurality of electrical contact sites, referred to herein as "contact lands" 114, reside on a bonding surface 116 of substrate 112 and are arranged to receive corresponding hard particles 118, which in the present embodiment, are affixed to metallized bonding pads 120 of electrical component 110. Hard particles 118 can be formed from a metal, metal alloy or

an intermetallic. In accordance with the invention hard particles 118 can be formed from, for example, copper, aluminum, nickel, tin, bismuth, silver, gold, platinum, ~~paladium~~ palladium, lithium, beryllium, boron, sodium, magnesium, potassium, calcium, gallium, germanium, rubidium, strontium, indium, antimony, cesium, barium, and intermetallics and alloys ~~and intermetallics~~ of these metals. Hard particles 118 can also be formed from a non-metallic material, such as, metal oxides, nitrides, borides, silicon and other carbides, beryllium, boron fibers, carbon fibers, garnet or diamond ~~, garnet or diamond~~. In a preferred embodiment of the invention, hard particles 118 are composed of a diamond core plated with a layer of nickel.

- On page 27, changes have been made to the paragraph beginning at line 7 as follows:

~~The reliability of the contact under ISO smart card flex tests was performed using _____~~. The reliability of the contact ~~test~~ was determined under flex tests performed in accordance with ISO standard No. 10373. The tests were not performed under contact or RF reader mode. Instead, contacts were attached to each card and the presence or absence of current was tested continuously. The ISO standard calls for satisfactory interconnect after 1000 flexes.

- On page 28, changes have been made to the paragraph beginning at line 14 and continuing over to page 29 as follows:

2. Smart card components attached in accordance with the present invention meet ISO standards, which require acceptable performance after 1000 flexes. (Three cards assembled with cyanoacrylate survived 4000 or more ISO flexes.)

- On page 29, changes have been made to the paragraph beginning at line 9 as follows:

4. Smart cards produced using the process of the present invention can "self-heal" during flex induced failures. It is believed that the contact can be opened during ~~pending~~ bending but upon relaxation, the contact between module and antenna coil is repaired.

In the Claims:

- Changes have been made to claim 23 as follows:

23. (Amended) An electrical component assembly as described in claim 21 further comprising ~~an~~ a non-conductive adhesive material applied to at least selected portions of the surface of the substrate and the plurality of hard particles.